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PESTS NOT KNOWN TO OCCUR IN THE UNITED STATES OR OF  
LIMITED DISTRIBUTION, NO. 21: SEYCHELLES FLUTED SCALE

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Order: Family

Homoptera: Margarodidae

Pest

SEYCHELLES FLUTED SCALE  
Icerya seychellarum (Westwood)

Economic  
Importance

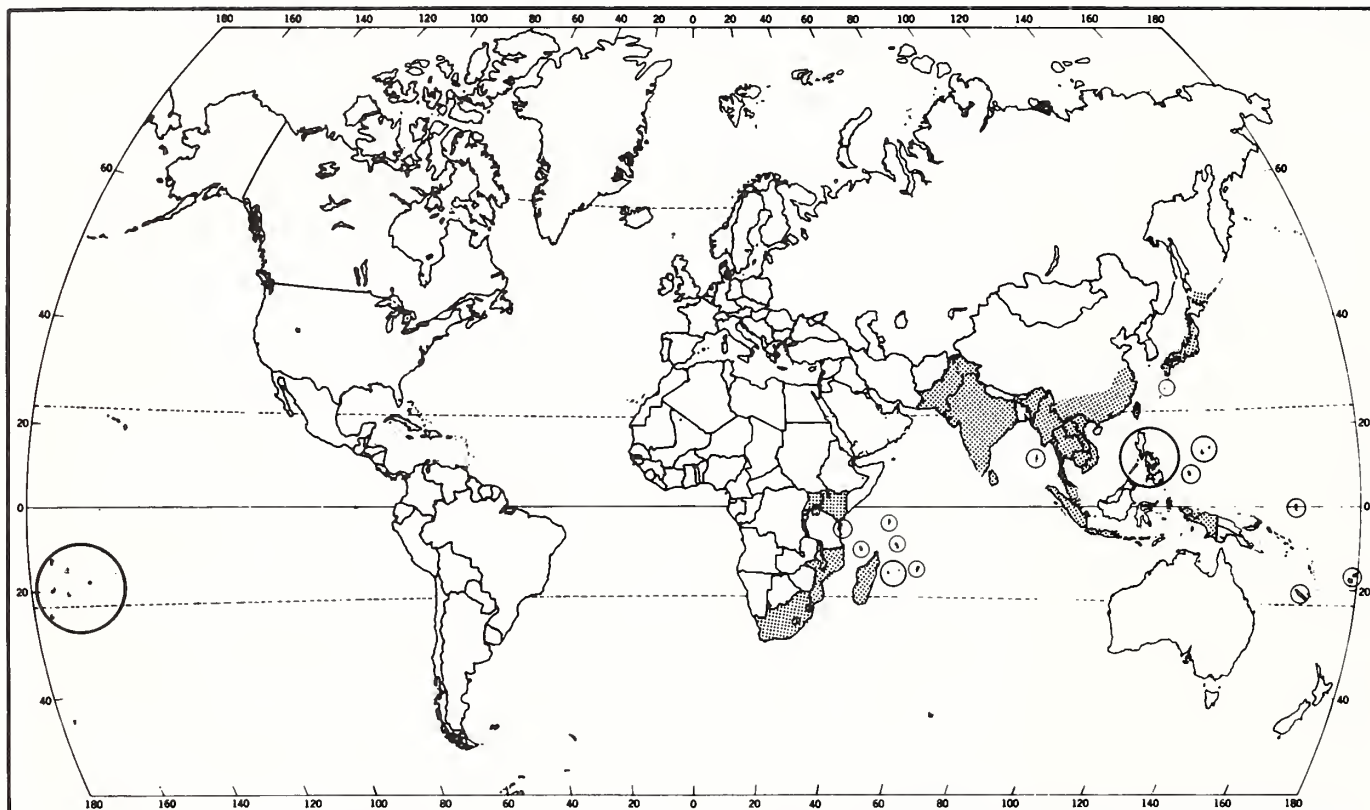
The Seychelles fluted scale was a serious pest in Mauritius, attacking nearly all orchard and ornamental plants and killing severely damaged trees before the introduction of a parasitic dipteran, Cryptochaetum monophlebi Skuse. In Seychelles, the scale was also a serious pest. Although controlled by coccinellid predators, it is still considered a minor pest of orchard and forest nurseries (Bedford 1965). The scale is a minor pest of Citrus in India, Japan, and South Africa (Talhouk 1975). Breadfruit trees (Artocarpus altilis) were severely damaged on some islands in Western Micronesia (Beardsley 1955). Dumbleton (1954), Maddison (1976), and Reboul (1976) list the scale as a pest of various fruit trees, ornamentals, and some vegetable crops on some islands in the South Pacific. According to Newberry (1980b, 1980c), the scale significantly reduced the growth of leaves and roots and contributed much to the decline of some heavily infested plants of a native species on Aldabra Island. I. seychellarum also reduced the plant growth and killed the apices of another species.

General  
Distribution

Africa: Agalega Islands, Aldabra Island, Egypt (Suez), Kenya, Madagascar, Malawi, Mauritius, Mozambique, Reunion Island, Rodrigues Island, Seychelles, South Africa, Uganda, and Zanzibar Island.

Asia: Andaman Islands, Burma, China (South China, Canton, Foochow), Hong Kong, India, Indochina, Indonesia, Japan, Malaysia, Pakistan, Philippines, Ryukyu (Amami Islands), Sri Lanka, Taiwan, and Thailand.

Oceania: American Samoa, Cook Islands, Fiji, New Caledonia, Niue Island, Palau Islands, Tahiti, Tonga, Ulithi Atoll, Western Samoa, and Yap Islands (Ali 1970, Almeida 1973, Beardsley 1966, Commonwealth Institute of Entomology 1955, Dumbleton 1954, Ezz and Samhan 1969, Maddison 1976, Rao 1951, and Wu 1935).



Icerya seychellarum map prepared by USDA, APHIS, PPQ,  
Biological Assessment Support Staff

## Hosts

The Seychelles fluted scale is a polyphagous species that attacks a wide variety of ornamentals, fruit and forest trees, and vegetable crops. In Mauritius, this species is recorded from about 145 host plants (Mamet 1948). Some of the agricultural host plants include: Annona muricata (soursop), Annona squamosa (sweetsop), Artocarpus altilis (breadfruit), Cajanus cajan (pigeon pea), Capsicum frutescens (tabasco pepper), Carica papaya (papaya), Citrus aurantiifolia (lime), Citrus grandis (pummelo), Citrus limon (lemon), Citrus paradisi (grapefruit), Citrus sinensis (sweet orange), Cocos nucifera (coconut), Coffea arabica (coffee), Cucumis melo (melon), Cucumis sativus (cucumber), Ficus carica (common fig), Ipomoea batatas (sweet potato), Litchi chinensis (lychee), Lycopersicon esculentum (tomato), Malus sp. (apple), Mangifera indica (mango), Morus sp. (mulberry), Musa paradisiaca (banana), Olea europaea (olive), Passiflora edulis (passion fruit), Persea americana (avocado), Phoenix dactylifera (date palm), Prunus persica (peach), Psidium guajava (common

guava), Punica granatum (pomegranate), Pyrus communis (pear), Solanum melongena (eggplant), Solanum tuberosum (potato), Tamarindus indica (tamarind), and Vitis vinifera (wine grape) (Maddison 1979, Mamet 1948, and Reboul 1976).

#### Characters

Early immature stage covered with bright yellow or white wax. Bodies of intermediate stages yellow, covered with yellow wax that are lobed marginally and fringed with long, glassy, waxy filaments (Bedford 1965).

FEMALE ADULT - Body broadly oval, convex, about 5 mm long, 3 mm wide, orange red, covered with granular wax, either yellow or white tinged with yellow, and with many long glassy, waxy filaments; wax cover tufted in median longitudinal row on dorsum, in marginal row around body, and in row dorsal of marginal row on abdomen (fig. 1). Ovisac white, project from posterior end of body, covered dorsally by series of long cylindrical waxy processes (Rao 1951). Legs and antennae of all stages black.

(Fig. 1)

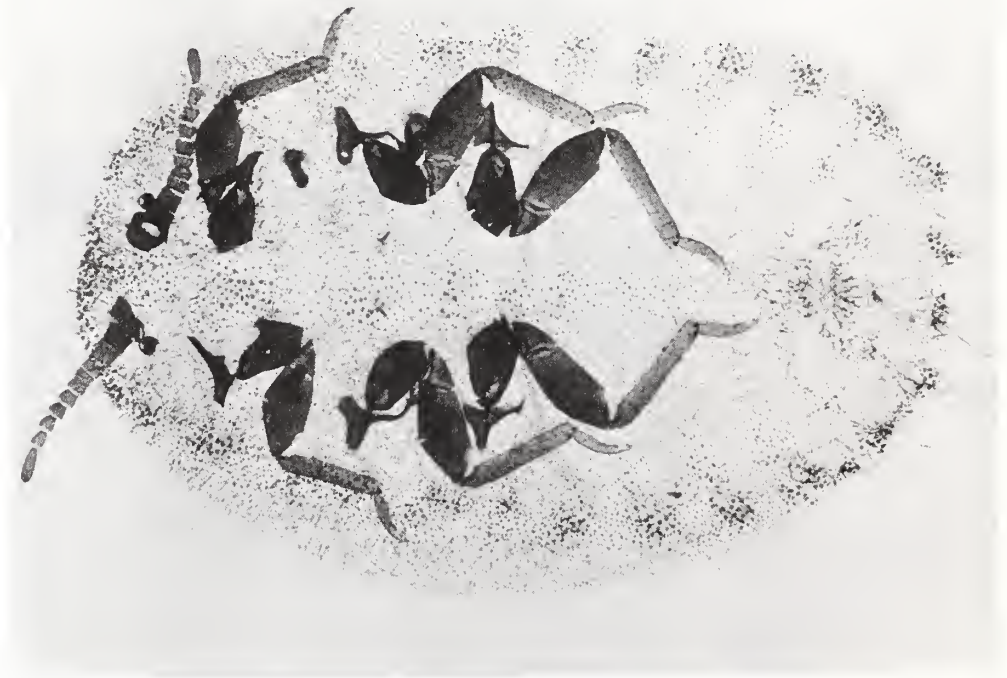


Icerya seychellarum: Immatures and adult females on undersurface of leaf (Courtesy of Entomology Division, Department of Scientific and Industrial Research, Auckland, New Zealand)



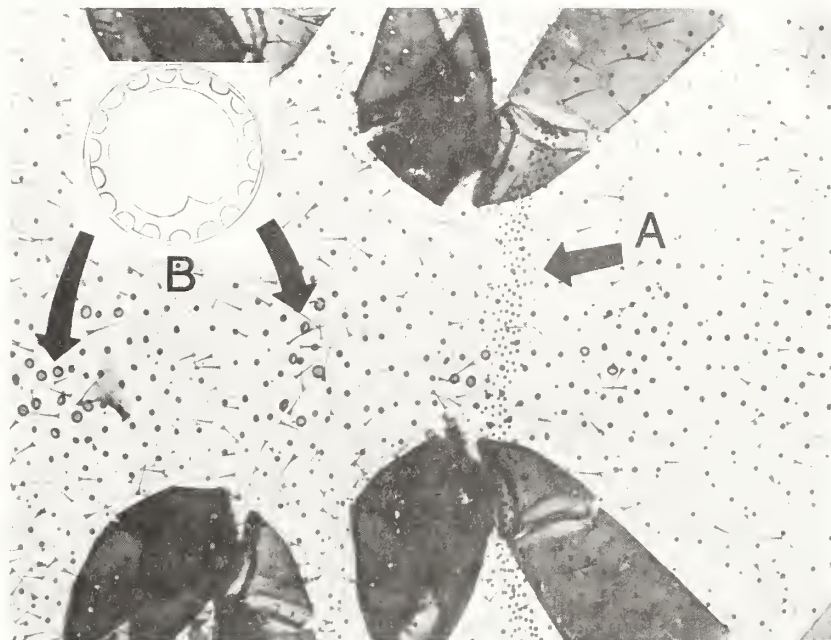
Diagnosis of adult female (fig. 2) - Antenna 11-segmented, legs well developed, body derm with numerous hairlike setae and pores. Setae of various lengths; longest setae in clusters on margins, and on dorsum around anal orifice. Pores of various types; large open center pores each with triangular projection in center (figs. 3B and 4A) in groups on margins associated with setal clusters, in dorso-medial groups on anterior abdominal segments, thorax and head, and scattered on abdomen and submargins of thorax and head. Abdomen with well developed ovisac band, mostly with bilocular pores (fig. 3A); 3 pairs of spiracles; 3 oval cicatrices, laterals smaller than median (figs. 4B and C).

(Fig. 2)



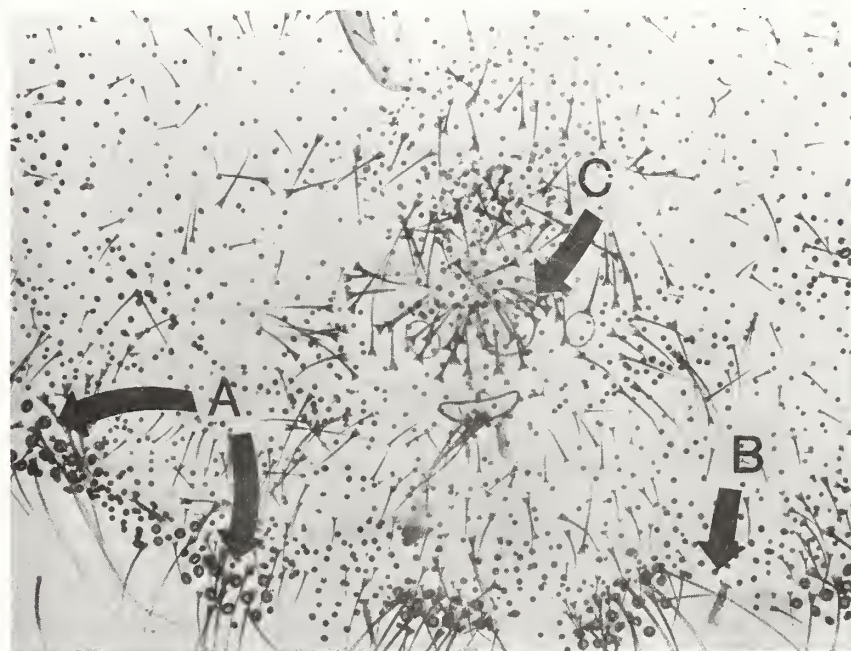
Icerya seychellarum: Slide mounted adult female

(Fig. 3)



*Icerya seychellarum*: Thorax and abdomen enlarged:  
(A) anterior part of ovisac band; (B) dorso-medial  
clusters of large open center pores

(Fig. 4)



*Icerya seychellarum*: Abdomen enlarged: (A) large open  
center pores; (B) abdominal spiracles; (C) cicatrices

Characteristic  
Damage

The Seychelles fluted scale infests leaves, twigs, smaller branches, and even petioles of flowers and fruits in heavy infestations. By sucking sap from plants, the scale lessens plant vigor and reduces leaf and root growth.

The apices of branches may also be killed. Heavily infested plants become partially defoliated, less vigorous and may be killed with crop yield often reduced (Beardsley 1955, Bedford 1965, and Newberry 1980b, 1980c).

Damage is also caused by the sooty mold fungi that develop on the honeydew secreted by the scale. Sooty mold fungi on leaf surfaces can reduce light transmission by as much as 25 percent (Teeders and Smith 1976) and thereby reduce photosynthesis. The upper surfaces of leaves and fruits become covered with honeydew and sooty mold fungi, thereby reducing the aesthetic value of plants and the market value of fruits.

This phloem feeding species prefers senescing leaves to green leaves, and removes water, carbohydrates, and nitrogen from the plants and secretes honeydew (Newberry 1980a, 1980b).

Detection  
Notes

1. Examine plants coated with sooty mold fungi for insects covered with white or yellow granular wax with long, glassy, waxy filaments. The bodies are yellow or orange red, with black legs and antennae and many hairlike setae; the setae on the body margins are long. Scales usually found along main veins of leaves, and on twigs, and smaller branches.
2. Collect specimens in 70 percent ethanol in a vial and submit for identification. Other species of Margarodidae have similar wax cover and coloration.
3. Mount specimens on slides and examine with a compound microscope for positive identification.

Natural  
Enemies

Cryptochaetum monophlebi Skuse (Cryptochaetidae), a Dipterous parasite, effectively controlled the Seychelles fluted scale in Mauritius (Bedford 1965). According to Clausen (1931) C. grandicorne Rondini heavily parasitized the scale in Japan. Bedford (1965) reared two specimens



of C. utilis van Bruggen in South Africa but states that Icerya seychellarum was not the normal host. The predators are mainly coccinellids. Rodolia cardinalis (Mulsant) was an effective control agent in Seychelles (Bedford 1965). Rodolia chermesina Mulsant and Exochomus laeviusculus Weise were effective predators in Mauritius when the ant, Technomyrmex detorquens Walker, was controlled (Moutia and Mamet 1946). Chilocorus nigritus L. was not a significant predator in Aldabra Island (Hill and Blackmore 1980) and Rodolia pumilus Weise is a suspected predator in Yap and Palau Islands (Beardsley 1955). Other coccinellids giving varying measure of control are R. obscura Weise in Malawi and South Africa (Bedford 1965); R. breviscula Weise in India (Kapur 1949), and Pullus coccidivora Ayyar in Pakistan (Ahmad and Ghani 1972). Chrysopa flavostigma Esb.-Pet. (Chrysopidae) is another predator in Seychelles (Vesey-Fitzgerald 1941).

## Biology

There are three immature instars. The adult female is viviparous, lays eggs in an ovisac, and is probably hermaphroditic. Males are rarely found (Newberry 1980b). In Japan, there is one generation per year. Mature females overwinter and lay eggs beginning in early June. The eggs hatch within a few hours after oviposition (Clausen 1931). According to Bedford (1965), one generation per year occurs in South Africa and most stages are present throughout the year. The immatures are most abundant during mid-summer and by the end of October, the scales are mature or maturing. On Aldabra Island the scale breeds continuously and completes a generation in 2 or 3 months. Although all stages are mobile, the scale is dispersed primarily in the crawler stage by wind (Hill and Newberry 1980).

Immatures and adult females are found mostly on the undersurfaces of the leaves, usually along the main veins. (as shown in fig. 1) (Bedford 1965).

Ants tend and protect the scales for honeydew. Hill and Blackmore (1980) report 4 species of ants tending the scale on Aldabra Island. In Seychelles and Mauritius, Technomyrmex detorquens Walker protects the scale from coccinellid predators (Dupont 1931, Moutia and Mamet 1946). Ant associations are also reported from Rodrigues Island (Mamet 1956) and Zanzibar Island (Way 1954).

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## References

- Ahmad, R.; Ghani, M. A. Coccoidea and their natural enemy complexes in Pakistan. Technical Bulletin No. 15. Rawalpindi, Pakistan: Commonwealth Institute of Biological Control. p. 59-104; 1972.
- Ali, S. M. A catalogue of the oriental Coccoidea (Part III) (Insecta: Homoptera: Coccoidea). Indian Mus. Bull. 5(1):9-94; 1970.
- Almeida, D. M. de. Contribuicao para un conspecto dos coccidea de Mozambique. Port. Aota Biol. (B) 12(1-4): 1-24; 1973.
- Beardsley, J. W. Fluted scales and their biological control in United States administered Micronesia. Proc. Hawaii Entomol. Soc. 15(3):391-399; 1955.
- \_\_\_\_\_. Insects of Micronesia: Homoptera: Coccoidea. In \_\_\_\_\_ Insects of Micronesia. Bernice P. Bishop Mus. 6(7):377-562; 1966.
- Bedford, E. C. G. An attempt to control the Seychelles scale, Icerya seychellarum (Westw.) (Homoptera: Coccoidea), in South Africa by introducing Cryptochaetum monophlebi Skuse (Diptera: Cryptochaetidae). J. Entomol. Soc. S. Africa 28(2):155-165; 1965.
- Clausen, C. P. Insects injurious to agriculture in Japan. Circular No. 168. Washington, DC: U.S. Department of Agriculture; 1931.
- Commonwealth Institute of Entomology. Distribution maps of pests. London, England: Commonwealth Institute of Entomology, Ser. A, No. 52; 1955.

- Dumbleton, L. J. A list of insect pests recorded in South Pacific territories. S. Pac. Comm. Tech. Paper 79; 1954.
- Dupont, P. R. Entomological and mycological notes. Rept. Dept. Agric. Seychelles 1930:11-13; 1931.
- Ezz, A. I.; Samhan, M. Icerya seychellarum (Westwood), a margarodid new to U.A.R. (Homoptera-Coccoidea). Agric. Res. Rev. (Cairo) 47(3):117-118; 1969.
- Hill, M. G.; Blackmore, P. J. Interactions between ants and the coccid Icerya seychellarum on Aldabra Atoll. Oecologia 45:360-365; 1980.
- Hill, M. G.; Newberry, D. M. The distribution and abundance of the coccid Icerya seychellarum Westw. on Aldabra Atoll. Ecol. Entomol. 5:115-122; 1980.
- Kapur, A. P. On the Indian species of Rodolia Mulsant (Coleoptera-Coccinellidae). Bull. Entomol. Res. 39(4): 531-538; 1949.
- Maddison, P. Interim report to the South Pacific Bureau of Economic Cooperation on pests of a limited range of crops. In UNDP/FAO survey of agricultural pests and diseases in the South Pacific. Part 2. Nematology, Entomology. Spec. (76)4:2-57; 1976.
- \_\_\_\_\_. Pests in the Cook Islands. Entomology Division, DSIR, Auckland, New Zealand; 1979.
- Mamet, R. A food-plant catalogue of the insects of Mauritius. Mauritius Dept. Agric. Bull. 30:1-74; 1948.
- Mamet, R. On some Coccoidea from the island of Rodrigues (Hemiptera). Mauritius Inst. Bull. 3(5):303-306; 1956.
- Moutia, L. A.; Mamet, R. A review of twenty-five years of economic entomology in the island of Mauritius. Bull. Entomol. Res. 36:439-472; 1946.
- Newberry, D. M. Infestation of the coccid, Icerya seychellarum (Westw.) on the mangrove Avicennia marina (Forsk.) Vierh. on Aldabra Atoll, with special reference to tree age. Oecologia 45:325-330; 1980a.

- Newberry, D. M. Interactions between the coccid Icerya seychellarum (Westw.) and its host tree species on Aldabra Atoll. I. Euphorbia pyrifolia Lam. *Oecologia* 46:171-179; 1980b.
- \_\_\_\_\_. Interactions between the coccid, Icerya seychellarum (Westw.) and its host tree species on Aldabra Atoll. II. Scaevola taccada (Gaertn.) Roxb. *Oecologia* 46:180-185; 1980c.
- Rao, V. P. Iceryine scale insects recorded from the Orient. *Indian J. Entomol.* 12(1-2):39-66, 127-128; 1951.
- Reboul, J. L. Principaux parasites et maladies des plantes cultivees en Polynesie Francaise. Polynesie Francaise Service de L'Economie Rurale, Recherche Agronomique No. 129/ER/RA; 1976.
- Talhouk, A. S. Citrus pests throughout the world. Technical monograph, CIBA-GEIGY Ltd., Basle, Switzerland, No. 4; 1975.
- Teeders, W. L.; Smith, J. S. Shading effect on pecan by sooty mold. *J. Econ. Entomol.* 69:551-553; 1976.
- Vesey-Fitzgerald, D. Some insects of economic importance in Seychelles. *Bull. Entomol. Res.* 32(2):153-160; 1941.
- Way, M. J. Studies of the life history and ecology of the ant Oecophylla longinoda Latreille. *Bull. Entomol. Res.* 45(1):93-112; 1954.
- Wu, C. F. Family Coccidae. *Catalogus Insectorum Sinensium* 2:169-252; 1935.